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collision svoidance period so as to set the length of the collision avoidance and a carrier sense method in response to the priority of transmission data distribution range of the random number is changed to insert a fixed wait slot to a head of the collision evoldance period, or a method where the method where some waiting slots are inserted to a set changing a distribution range of the random number, or a ranking information with a random number without sequentially shorter for data packets with high priority obtained by multiplying the alot times selected consisting of a multiple of basic unit times (slot times) is method where a collision avoidance period Tow data packet of an 'excellent effort type' by adopting a packet with high priority is not in existence. priority has a wait time without fall oven when a data priority control method that realizes priority control of a SOLUTION: This invention provides a wireless packet utilizing efficiency because a data packet with low avoidance period has had a deteriorated frequency a random number in the case of setting a collision adopting a method for deciding transmission priority with conventional wincless packet priority control mathod PROBLEM TO BE SOLVED: To solve a problem of a

(54) WIRELESS PACKET PRIORITY CONTROL METHOD

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# PATENT ABSTRACTS OF JAPAN

\* NOTES

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CLAIMS

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[Claim 1] It is in the base transceiver station connected to a cable notwork, this base transceiver station, and a dependency. Consist of two or more radio stations which perform wireless packet communication, and said base transceiver station and the radio station of said large number use a common ratio channel, and the propriety of transmission is multually judged independently at the time of a communication link. The collision of a packet is avoided. In the wireless packet priority-control approach in the wireless packet communication which performs the contention access control based on CSMA/CA (Carnier Sense Multiple Access Collision which shows the height of the priority in the inside of the best offert type which should perform transmitting processing within the contention access-control section is received, said base before the data transmission by issid contention access control in a setup of the collision—serolance period (Contention Window) which consists of a multiple of base unit time amount (labit time) The wireless packet priority-control approach that a data packet with the higher priority information on said memorized data packet is characterized by setting up said slot time should be shown.

[Claim 2] It is said wireless packet priority—control approach according to claim 1. The higher data packet of the priority of the priority information on said memorized data packet When setting up said collision—evolutance period short, the slot time ever the high data packet of said priority is set up shorter than the slot time over the low data packet of priority. The wireless packet priority—control approach characterized by setting up the time amount which multiplied by said random—number value acquired using the random number, respectively as a collision—evolutance period.

evaidance period over a data packet beforehand, and was sequired, and from the collisionby the value which used said random number for the slot time which defines the collision-[Claim 4] It is the wireless packet priority-control approach according to claim 1. The higher data packet of the priority of the priority information on said memorized data packet Whan setting up said collision-evoidence period short, the minimum value and maximum of the value and arrianging the valve of N, so that the priority of the data packet is high amount which added 1 slot time for every N Ot integer) slot time as a collision-avoidance period. random-number value which used the random number for the stat time defined beforehand, and opposed to the data packet of other priority. To the time amound which multiplied by the collision-avoidance period over the data packet of the highest priority, and was acquired. As by the value which used the random number for the slot time which defines beforehand the high data packet of priority sets up smaller, and it considers as the time emount which multiplied which the random number made to generate a random-number value can take The thing to the was acquired The wireless packet priority-control approach characterized by setting up the time sotting up said adiision-evoidence period short, it considers as the time empunt which autiplied data packet of the priority of the priority information on said memorized data packet When [Claim 3] It is the vareless pecket priority-control approach according to claim 1. The higher

seroidance time amount at the time of the 1st back-off control of data packets other than the highest priority. To the time amount which lengthened the collision-avoidance period which the data packet of the highest priority spent. The wireless packet priority-control approach characterized by setting up the time smount which added the time amount which multiplied by the start time beforehand set to the \*\*\* value of said random number as collision-avoidance time amount at the time of the next back-off control, and repeating this until it transmits a data packet.

[Claim 5] The base transcaiver station which said radio station transmitted the priority information on the data packet which transmits before the data transmission by said contention access control by the communication packet to said base transceiver station when it was the wireless packet priority-control approach according to claim 2 and said hase transcaiver station HEDETA packet was transmitted from said radio station, and received this communication packet is the wireless packet priority-control approach characterized by to notify corresponding text time to said radio station by the communication packet based on the priority information on this data packet.

(Claim 6) The base transceiver station which was the wireless packet priority-control expresch according to claim 3, and sold radio station transmitted the priority information on the data packet which transmits before the data transmission by said contamion access control by the communication packet to said base transceiver station, and received this communication packet when said base transceiver station HEDETA packet was transmitted from said radio station is the whreless packet priority-control approach characterized by to notify the value of said N to said radio station by the communication packet based on the priority information on this date packet.

[Giaim 7] When it is the wireless packet priority—control approach according to claim 4 and transmits said base transceiver station NEDETA packet from said ratio station, said ratio station. The base transceiver station which transmitted the priority information on the data packet which transmits to said base transceiver station by the communication packet, and received this communication packet before the data transmission by said contention access control. The wireless packet priority—control approach characterized by notifying the minimum value and maximum of said random-number value to said radio station by the communication packet based on the priority information on this data packet.

[Translation done.]

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## DETAILED DESCRIPTION

Detailed Description of the Invention

the packet in within the limits of a best effort type. which makes possible the priority control which started wireless LAN, especially distinguished [Fleid of the Invention] This invention relates to the wireless packet priority-control approach

wireless LAN system specified in IEEE 802 Committee is typical Description of the Prior Art] Generally, as a wireless access method, the access method in the

using the OSMA/GA (Cerrier Sense liadtiple Access Gollision Avaidance) method which packet may not arise, DCF (Distributed Coordination Function decentralized control procedure) base transceiver station (AP) and a subordinate carry out carrier sense so that the collision of a transmits data is used. LAN Medium AccessControl(MAC) and Physical Layer(PHY) Specification, P80211D 8.0, 1 May [0003] This convention is described by the detail at "IEEE802.11, Draft Standard for Wireless (0005) Here, shout the contection access control, while two or more STAs (radio station) of a [0004] The access method of a MAC layer is described in "IEEE802.11 specification." 1998." Horeafter, this convention is called as "IEEE80211 specification" and explained.

passage of time, for example, the actuation after data transmission of STA1 is completed is which cerry out wireless packet communication are shown by making an axis of stackssa into the (0006) <u>Drawing 5</u> shows the communication link actuation to the time emount in DCF which (EEE802.11 specification" is shown in this drawing, two radio stations (STA is called hereafter)

data packet signal relates to this invention. of accase, in addition, DDFS used as the carrier sense time amount in the case of transmitting a SIFS (Short UFS), PUFS (POF(Point Coordination Function) UFS), DIFS (DistributedUFS), and EUFS sense for AP and STA to get to know the condition of a wireless medium, and four kinds such as (ExtendedIFS) are specified in the short order of time amount, i.e., the high order of the priority [9007] Here, in "EEE80211 specification", IFS (Inter Frame Space) is the time amount of carries

easumed that AP and STA2 suited the transmitting standby condition [0008] Here, data transmission is performed from STA1 to AP at time of day T, and it is

which answers reception of that, AP and STA2 stand by until they carry out (TD) progress (0009) First, STA1 transmits date P1 to AP, and after receiving from AP the ACK pecket (Pa)

value, and the collision-avoidance period Tow comes. amount (slot time) of a collision-avoidance period is spent on the acquired random-number dstributes uniformly in the decision of this collision-evoldance period. And the base unit time all STAs containing AP subtract the random number which the integer of a certain range amount is given to each of AP and STA2. This collision—avoidance period is searched for by the [0011] AP and STA which have the data packet which should transmit as the Ruhr in [whole] multiplication of base unit time amount and a random number so that it may mention later. [0010] And the collision-evoidance period (Contention Window.Tow) used as random time

> efter this collision-evoidance period (4 stat time) prograss. Transakselon of STA2 at this time is preferential and the collision evolutions period Tow of given AP transmits data to STA1 from AP explained heaceforth, it is the same. Since it is short compared with STA2, AP becomes evoldence period of 7 come x slot time is given to STA2. Also in the drawing of this invention example, the collision-proidence period of 4 come x shot time is given to AP, and the collision progress in <u>framing 0</u>, 1 slot time (the number of 1 slots) is disstrated with one come, in this [0012] Transmission is atterted if a wireless medium does not become a busy after this period

bottom of a race condition by the above sequences. period progress, since Tow in the back off of STA2 becomes the shortest abortly, STA2 [0013] Furthermore, the ACK (Pa) transmission to AP is ended, and further, after DIFS(TD) pecomes data ready-for-sending ability. The collision is ensuring little packet transmission to the

ecquired with the random number, respectively before data transmission, they become possible transmitting to coincidence by carrying out standby of a different collision-evoidence period [0015] In order for two or more STAs which have data which should be transmitted to provent proventing the collision of a data packet ] coincidence probable, and the latency time in this back off hits at a collision—woldance period above is ectuation for reducing the collision between STAs which are going to transent to [0014] The RANDEAU back off used as the latency time after the DIFS progress mentioned

[0018] <u>Drawing 6</u> is drawing for explaining the enother conventional approach.

of a packet which should be transmitted. subtracts changes that range not according to uniform distribution but according to the priority performed because the random number which STA with the data packet which transmits avoidance period Text, and the priority control according to the priority of a data packet is technique mentioned above, priority attachment is performed to the die length of the collisionof data and the collision-evoidance period Tow was given at random with the conventional [0017] In this conventional example, although are concerned, there is nothing in the importance

to the priority of the packet of data which should transmit the integer range over which this the back off, each of STA and AP subtracts a random number, but weighting is made according present circumstances, in determining the collision-evoidance period Tow which is a period of STA2 pass between DIFS(s) (TD), a procedure moves from them to the back off, Under the random number is distributed. packet P2 has priority lower than P1, 5 slot time surely turns into the letency time. \*\*\*\*\*\*\*\*\*\*\*\* I in, the slot time of 5-10 is in a data packet P2 in this case, since a data value)+0-5 [0-5 are assigned to this data packet P1 for slot time and / slot time / with AP after packet transmitting termination of STA1, and has these Requests to Send. Sfixed unreseen to STA2 in the packet date P1 with which priority is given to transmission compared two games sharing the same frequency, and AP has the data pecket P2 over which priority is (0018) After STA1 receives the ACK pecket to own data transmission, after both AP, STA1, and [0018] This example shows what communicates by AP and the radio station (STA1, STA2) of

0-5 as waiting slot time for transmission of a data packet P1. reason, the waiting stat time in this back off is again set to "6," \*\* "4" has been obtained from this is smaller than "5" of the slot time which must be made into the latency time. For this \*\* The waiting slot time in the last back-off control is "4", and this is smaller than "5" of the between transmission of a data packet P1 to 0-5, \*\* Value 3" has been obtained from between back off is again set to "6." \*\* Set the waiting slot time in the last back-off control is "3", and siot time which must be arade into the latency time. For this reason, the waiting slot time in this time is given for a data packet P2 from between 5-10 as the packet transmitting latency time. [0020] By ++, since priority is lower than a data packet P1, specifically, for example, "6" slot

with 5-10. Thus, in order that STA2 which is going to transmit the low data packet of priority with low priority as for the range of a random number, the range of a random number is set up that AP may transmit the high packet of priority and 0-5, and STA2 may transmit the packet to the header information in the head of the data which should be transmitted etc. And in order [0021] In the case of <u>framing 6</u> [ such ], the priority of transmission is determined with reference

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surely be transmitted in advance of STA2 may wait { in / slot time / 5 / in the minimum / \*\* beck-off control }, the data pecket of AP will

becomes possible by changing the range of a random number according to the priority of a data [9022] As mentioned above, the priority control within a contention secess-control DCF period

Expediting and Dynamic Multicast Filtering, P802 (D, 25 May 1898," Harvalter, this convention is hes a typical mathod using the priority class specified in IEEE 202 Committee. This convention is described by the detail at "IEEE P802.1D Annex H. Dasign Consideration for Traffic Class balled "IEEE P802.1D specification. (Problem(s) to be Solved by the Invention) The priority control set as the object of this invention

according to the priority in the inside of a best effort type. effort mold). The priority control is this invention is the type of the latter which performs control guarantee of bandwidth, here, and a guarantee are not needed, they are divided roughly into a in "IEEE P8021D specification" / priority ] such as a guarantee of the maximum time defay or a [0024] Although the class which asks for "a positive guarantee" of qualities of service [ class / preferential BESUTOETO modd" class with priority higher than a best effort typs (excellent

order to make a contention access control without a collision possible by applying the integer given to the number of slots which is the fixed-length conventional time with the generated random number is set up. [0025] Here, in DCF in "IEEE 802.11 specification", the period "Contention Window" required in

opportunity", this priority attachment is not performed DCF based on CSMA/CA, since it sets it as the main purposes to give "a fair access packet with priority, in the wireless access method which gave semantics, priority attachment is needed but for transmitting specing of data to a setup of Tow, and in the decembralized control (0026) By the way, in order to perform the priority control according to that priority to a data

considering as fixed time, the way things stand, control to the priority of a packet carnot be performed which distributes uniformly the slot time which is the conventional time of the back off by advantage of the random nature of a random number which made it generate from the integer [0027] That Is, since the die length of the callisian-evoidance period Tow is set up taking

collision-avoidance period Tow setup as the priority-control approach based on DCF as which the former which was mentioned above is proposed. according to the priority of a data packet to the random number subtracted in the case of a [0028] Moreover, there is a mathod of changing the intager range over which it is distributed

docline in frequency use effectiveness. this approach. The unnecessary latency time will exist by this and there is a problem of causing termination even when the high data packet of priority does not exist for example, drawing 6, by the low data packet of priority is prepared for the high data packets of priority efter DJFS (0029) However, it must wait for 5 slot time of the collision—evoidance period in the range where

is difficult and the features of each control approach of PCF and DCF cannot be utilized priority control carrying out to a guerantee of communication link quality has the trouble that it contention access period by distributed cooperative control, even if it can perform a perfect AP, to QA of a priority control and a communication link being attained, by DQF which offers the [0030] Furthermore, in a setup of the non-competing access period by the centralized control of thoroughly for this reason.

and are not in the priority control within the DCF period by which the conventional proposal is salve the trouble that the priority control which followed the priority of data by performing a made were made to reflect more. setup of the collision-evoidence period Tow based on the random random number is not meda which the features of the "fairness of access" which a contention access control has which [0031] Then, this invention aims at offering the wireless packet priority-control approach in

[Means for Solving the Problem] The base transceiver station connected to a cable national in

evoidence period (Contention Window.Tow), the probability which becomes short becomes high and a data packet with priority high as a result is transmitted previously. data is higher as short time amount for slot time, as for the die length of a random collisionhigher by such wireless packet priority-control approach by setting the one where the priority of packet sets up said slot time shart is offered in a setup of the collision-evoldence period control approach that a data packet with the higher priority information on said memorized data before the data transmission by said contention access control The wireless pecket priority transociver station and said redio station Memoriza, while ecquiring this priority information, and (2003) Even if a large random number is given to the one where the priority of a data packet is (Contention Window) which consists of a multiple of base unit time amount (sigt time). transmitting processing within the contention access—control section is received, said base which shows the height of the priority in the inside of the best effort type which chould perform Avaidance) which transmits a wireless packet If a data packet including this priority information the contention access control based on CSMA/CA (Carrier Sense Multiple Access Collision wireless packet priority-control approach in the wireless packet communication which performs independently at the time of a communication link. The collision of a packet is evoided in the number use a common radio channel, and the propriety of transmission is mutually judged packet communication, and said base transcraiver station and the radio station of said large station and a dependency, and consist of two or more radio stations which perform wireless order that this invention may attain the above-mentioned purpose. Are in this base transceiver

it Judges whather it is the data packet which asks for QA (step S4), and if it is the data packet guarantee) (step SS), and will transmit to the wireless terminal STA by centralized control PCF which asks for QA by this decision (Yea), it shall be a QA mold (a band guarantee and time delay data packet is inserted in the queue corresponding to the priority checked have (step S3). Here, control information which AP reports that this period and period are. information on deta that it errived from the cable network side is received (step S1) (step S2). A repeated a fixed period, and wireless packet communication is performed by directing by the and transmitting a wireless packet, and the non-competing access control by AP poling is cable network and a redio station (STA) which is in this AP and dependency and carries out control based on the OSMA/GA (Cernier Sense Multiple AccessCollision Avoidance) method of (0035) Under the present circumstances, the period which performs the contention access wirdess packet communication, and AP and all STAs are using the common radio channel. communication link of this invention consists of a base transceiver station (AP) connected to a concept of the wireless packet priority—control approach by this invention is explained. The (0036) First, AP will check the priority of a data packet, if a data packet including the priority detail with reference to a drawing. First, with reference to the flow chart shown in  $ext{drawing 2}$  , the udging the propriety of treasmission autonomously mutually, permitting the collision of a packet Embodiment of the Invention) Hereafter, the operation gestalt of this invention is explained to a

the packet (excellent effort mold) which should transmit more preferentially than (No) and a best [0031] On the other hand, in not being the data packet which asks for QA, it judges whether it is

and STA2. Let this collision evoldance period be the collision-evoldance period Tow over the base unit time amount (slot time) in the random-number value and collision-avoidance period random collision-evoidance period (Contention Windom Tow) will be given as usual to each of AP bast effort type, it will be recognized as what is (No) and a best effort type (step S&), and a (DCS8) By this decision, if it is not the packet which should transmit more proferentially than a which were langthened from a certain range.

recognizes as (Yes, i.e., an excellent effort mold) (step S12). when it is the packet which should transmit preferentially rather than a best effort type, it period will become zero (step \$10), it transmits (step \$11). Moreover, in decision of said step \$7, (step S9), and if the radio frequency is intect (Yes), as soon as the given collision-evolutince (NOS) And it judges whether a ratio frequency is infact after progress of a DFS (TD) period

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[DD41] And it judges whether a redio frequency is intact efter progress of a DJFS (TD) period ettachment by the back-off control period mentioned later (step S13). evoidance time amount to become short may become high by the approach of performing priority maid By setting up die length shart, it sets up so that the probability for random collision-[0040] Tow which is explained with the operation gestalt mentioned later in this excellent effort

contention access-control section is received. AP will be memorized while it acquires said priority within the best effort type which should perform transmitting processing within the period. Here, if a data pucket including the priority information which shows the height of the Information is received, it will transmit to the purpose terminal in a contention access—control is a non-comparing access-control period, and when a data packet including the other priority a data pecket with such priority is transmitted to the purpose terminal in the PCF period which bandwidth of the data with which AP specifically arrived from the cettle network side is received period will become zero (step S15), it trensmits (step S16). If a data packet including the priority information which shows the permission transfer delay time amount and the necessary minimum (step S14), and if the radio frequency is intact (Yes), as soon as the given collision-avoidance

from the high class of priority is made high in a setup of the collision-avoidance period Tow of contention access control a rendom number will be subtracted, and the probability which the standing by only the value. high packet of priority can transmit to order first by shortening the die length of the slot time [0042] Furtharmore, if the wireless circuit is vecent before transmitting the data based on a

number slot other than the assigned slot time. the latency time (waiting dot) of the slot time beds still more nearly excessive N times for every priority to a setup of the collision-avoidance period Tow of DCF control in a collision-avoidance attachment performs carrier sense of the slot time basis in back-off control originally it inserts period Tem setup of a contention access control as the 2nd method of performing priority [0043] Furthermore, in case the terminal which is going to transmit the low data packet of

control, and the random number assigned from each integer range is determined. of DCF control in the case of a collision-evoidance period setup by the contention access an approach of performing priority attachment, in a setup of the collision-avoidance period Tom the generating range of the random number which each STA subtracts is left and determined as [0045] Moreover, the part which the range overlaps mutually by the priority of a data packet in the low data of priority by this serves as zero as a result of [ its ] lateress is made high. amount from which the collision-evoldance period Tow of the terminal which is going to transmit [0044] The probability that the high pecket of priority can be first transmitted for the time

of slot time for which it exceeded and waited. packet of priority can be transmitted first is made high by reducing only the part of the number the time amount for which it must wait in ++ back-off control, the probability that the high waits for the collision-evoldance period of a next contortion soccess-control period exceeding collision—avoidance period, the data transmission from the end of a local is interrupted. When it number is set to \*\* back-off control. Surely Westing, When other STAs transmit data during a value which imposed slot time on the animum value in the range of the subtracted random the terminal which is going to transmit the low data packet of priority. The time amount of the which is not concerned with priority but has a fixed value in the subtracted random number. And [0046] Furtherance, it considers as a collision-evoldance period by multiplying the slot time

return [ time amount / the / base unit ] callision-evoidance period permitted to this STA, and transmits a connection packet to STA by communication packet determines the die length of the basic time-basis time amount of the the packet which transmits to AP as a communication packet. And AP which received the STA to AP, in advance of transmission of a priority data packet, STA transmits the priority of [0047] Mareover, when there is a data packet Request to Send of the going up direction from

the packet which transmits to AP as a communication packet. And AP which received STA to AP, in advance of trensmission of a priority data packet, STA transmits the priority of [0048] Moreover, when there is a data packet Request to Send of the going-up direction from

> according to the class of data transmitted. length and the random number of slot time in the collision-evoldence period Tow are distributed is realizable to a "best-effort" data packet by setting up the integer range over which the die [0049] As mentioned above, the prinkly control of the data packet of an "excellent effort mold turns up the setting information on Tom, and transmits by the communication packet to STA this STA corresponding to the priority of a packet, or the generating range of a rendom number communication packet determines insertion spacing of the waiting slot time in Tow permitted to

approach by this invention. [0050] <u>Drawing 1</u> explains the 1st operation gastaft of the wireless packet priority-control

of a best effort type taking edverdage of the features of fairness serious consideration of a to the priority of data, and is the method which performs the priority control in within the leaits contention access control. the unit time amount of one slot of AP or STA, and setting die length as it beforehand, eccording the wirelass medium between AP and STA, and / back-off control.] It is distinguishing between (0051) This 1st operation gestalt is Tow [ in / it is an access-control mathod based on DCF in

collision—avoidance period of the terminal which is going to transmit the high pecket of priority is [0054] In addition, in order to perform the approach of weighting whether to transmit the high shortened, and the probability which can be transmitted first is made high. (TBxxxx=0-10) of a long period to low packet transmission (for example, the STA side), the unit time amount, without changing the range of a random number, and slot time is changed [0053] As shown in <u>drawing 1</u>, priority is given because give slot time TA of a short period to high packet transmission (for example, the AP side) of priority and priority gives the slot time excellent effort mold, priority ettachment of Tow is performed. Here, it distinguishs between base [0052] In step S7 of the flow chart of  $\underline{degwing 2}$  mentioned above, when recognized as the

performed with a degree of freedom. Therefore, a setup of the practity of a transmitting probability according to priority can be deta packet of priority with the priority of how much to the low data packet of priority, by the width of face of slot time, the relation of both slot time does not need to be an integral multiple

operation gestalt is explained (<u>Distring 1</u> is an example about the control at the time of taking a time-exis along an exis of ebscissa, ectuation of the communication link in each terminal being [0056] 1 slot time over the STA2 side by which priority sets to TA 1 slot time over AP made data packet of the priority of the waiting for transmission existing in STA2 further. being completed, a packet including priority reaching AP from a cable network side, and the low shown on an axis of ordinate, the data packet transmission to AP from STA1 and ACK reception [0055] The example of operation at the time of performing the priority control in the 1st

high, and is made low [ priority ] which serves as the description with this operation gestalt is [0057] First, ofter STA1 receives the ACK packet which is the chack over transmission to AP,

period DIFS (TD) defined beforehand AP and STA2 with the packet of the waiting for transmission go into the comier sense of the [0058] After this DIFS period (TD) checks that a wireless medium is a no-bransmission state, AP

in the example in <u>drawing 1</u> ), a random number is subtracted and each slot time is applied to the on this relation, and out of uniform distribution with the equal integer range (referred to as 0-10 differs. In addition, at the example shown in <u>drawing.</u>], it is k=1.5.-1; is referred to as (2), it is (TB=taTA is it becomes rate) of the priority of the data pecket transmission from which priority transmission, respectively. Under the present circumstances, when the priority of the data and STA2 start the back-off control used for the collision evoidance of data packet lengthened random-number value. the slot time given to the die langth TA and STA2 of the slot time given to AP is TA(TB. - (1) packet which AP is going to transmit considers as a high thing, the relation of die-langth TB of

ratio of the packet pricrity of AP and STA2 mentioned above although the collision-avoidance period of AP was 7 slot time and the collision-evoidance period of STA2 was 6 slot time, since it However, the relation of Tow of both, who saw from time amount length from (2) types which the [0039] "6" is assigned to "7" and ++STA2 by ++AP in the example shown in <u>trawing 1</u>.

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was 1.5 times, is 1xTA(6xTB=6x1.5xTA, -- (3)

sense of a DUFS period (TD) is cernied out further. the communication link, after AP receives ACK (Pa) to own transmission from STA1, carrier It becomes. Thursby, high AP of priority performs date transmission (P1) shead of STA2. After

relation of Tow of \*\*AP and \*\*STA2 both is 4xTAC3xTB=3x1.5xTA from (1) and (2) types. — (4) essigned, and the collision avoidance period should turn into 4 slot time. Consequently, the be set to TA, and the random number should nearly be subtracted, for exempte, "4" should be of ++STA2 turns into 3 slot time which deducted 3 slot time which has passed since 8 slot time. Mareover, since the priority of the data packet of AP was high, the die length of slet time should transmission exists again will start back-off control. At this time, the collision-evolutance period [0060] Here, if it is a no-transmission state, AP and STA2 in which the packet of the waiting for

egain, and AP performs data transmission (PI) previously. It becomes the relation to say, the collision-avoidance period of AP becomes shorter than STA2

A next door and the collision-avoidance period of STA2 become short, and the transmission of a date packet P2 of them is attained from AP. relation of Tow of AP and STA2 is 5xTA>2xTB=2x1.5xTA from (1) and (2) types. — (5) serves as TA. If the random number which AP in this back-off control subtracted is "5", the the Request to Sand of the high packet of the 3rd priority happens to \*\*AP, and slot time length [0081] And after corrying out carrier sense of a DIFS period (TD), in the next back-off control,

a result. It emblos this to perform a priority control, with the features of a contention soccess [ the probability which becomes short ] high, and priority can transmit a high data packet first as data packet is higher, a random collision evoidance period (Contention Window: Tow) becomes data packet is higher, even if a large random number is given to the one where the priority of a the slot time in a collision—avoidance period is short set up from the one where the priority of a [0082] As mentioned above, eince, as for the priority-control approach by this operation gestelt

[0063] Next, <u>dressing 3</u> explains the 2nd operation gestalt of the wireless packet priority—control approach by this invention.

range and 1 slot time of a random number. digestive approach of the given collision-avoidance period Tow is changed, without changing the was the approach of performing priority extectment to a packet, in this operation gestalt, the the range of a random number, the collision-avoidance period Tow is changed, and although it [0064] With the 1st operation gostalt mentioned above, 1 slot time is changed without changing

as this result is made high. originally assigned. The probability that the high data packet of priority can be first transmitted which stands by in a 1-time excess for every number slot time in addition to the slot time the wireless medium is not used, it is the control approach which inserts the waiting slot time transmit the low data packet of priority in a collision-avoidance pariod Tow setup checks that [0065] In back off control in case the terminal with which this operation gustalt is going to

transmit the high packet of priority as a result can transmit first becomes high priority to transmission decreases, and the probability which the terminal which is going to thing of priority, the latency time of the terminal which is going to transmit the packet with high the digestive rate of the collision-avoidance period Tow becomes early compared with the low avoidance period Tow is set up at random in the phase which subtracts a random number, since [0068] Therefore, eithough it is not concerned with the height of priority but the collision-

slot time, and it is the features that the effect can be lessened time of a high priority packet absence between fixed range, but considering as N time at number indispensable latency time produced at the time of the low priority packet transmission at the generating range of a random number, Moreover, it is not taking collectively the excessive priority to differ is performed by the approach of digestion of the collision-evoidance period in back-off control, and it can carry out, without changing the width of face of slot time, and the [0087] By this approach a setup of the priority of the data packet transmitting probability for

[0069] <u>Drawing 3</u> takes a time—axis along an axis of abscisse, and actuation of the

back off control, respectively. operates after progress of DIFS (TD) like graving 1 monitioned above until AP and STA2 started (0009) First, a series of data transmitting procedures from STA1 to AP are completed, and it should reach AP from a cabbo natwork side, and should transmit to STA2 further exists. it is in the condition that the low data packet of the priority which a packet including priority transmitted to AP from STA1, and reception of ACK (Pa) to the transmission is completed. And communication link in each terminal is shown on the exis of ordinate. First, a data packet is

data of priority, and the low data of priority, ona value is given from the random number to [0070] And as far both STAs2 that are going to transmit AP which is going to transmit the high

given to STA2, every 2 slot time, the waiting slot time for 1 time is set as a pan by one so that it number 3" and ++STA2 shall be 7 slot time by random-number 7." At this time, in 7 slot time time amount in fact. may be. Therefore, the collision-avoldence period Tow turns into 11 slot time and equivalent same time amount, and, in the case of <u>drawing 3</u>, 3 slot time according [ \*\*AP ] to random-[0071] For example, one orneria slot time shall not be based on priority, but shall consist of the

evolutance period Tow early 1.5 times compared with STA2. exists in AP and STA2 both, AP which has the high data packet of priority digests the collisionperiod, since AP and STA2 have set up with 1.5 the ratio of the priority of the data packet which [0072] And although both reduce the collision-avoidance period Tow during the beck-off control

for 5 slot time (in order that three waiting slot time may enter in fact, it is equivalent to 8 slot surroundings and \*\* collision-evoldance period Tow becomes next back-off control with a part transmits data and a part for 3 slot time is digested is digested, but, in the remaining parts, up by the random numbers in fact since I slot time was added to 2 slot time in STA2 while AP [0073] For this reason, only a part for 2 slot time among the collision-avoidance time amount set

packet of priority reaches AP from a cable network side, AP lengthens one value cut of the random-number range 0-10 again, and "6" gives — having — ++ — the following collision time / 1.5) ((5x slot time) - (6) transmission was postponed is 5 slot time and it compared 6 slot time of this and AP ] (fox slot avoidance time amount Tow turns into  $\theta$  slot time. Result [ Tow of STA2 by which the 1st [0074] next, AP transmits the 1st data packet, after progress of DUFS (TD), when the high data

of AP becomes short, and it will pracede and transmit. Also in a next door and the 2nd back-off control, the direction of the collision-avoidance period

of waiting slot time is contained, it is equivalent to 2 slot time) remains. STA2. 4 slot time is digested and, as for 5 slot time of STA2. 4+1 slot time (in fact, since 1 time [0075] And when AP transmits the 2nd data packet, since 6 slot time is digested by AP, by

\*\*AP serves as 3 slot time. priority reaches AP from a cable naturark side, AP subtracts a random number out of the random-number range 0-10 to it, and obtains random-number value "3" to it. Thereby, Top of [0078] Next, after progress of DUFS (TD), rather than STA, when a data packet with still higher

time (it is 2 slot time containing one waiting slot time in fact), and they are AP, and STA2 and Tow. (3x slot time / 1.5) > (1x slot time) — (7) [0077] By the way, in the 3rd transmission, the value of Tow of law STA2 of priority is I slot

this transmission, 2 slot time is digested and the collision-evoidance period of AP turns into 1 The data packet of STA2 is transmitted at last by the next door and the 3rd time of these. In

order that two weating slot time may enter, it is equivelent to 6 slot time). oblains random-number value "4." Theraby, Tow of \*\*STA2 serves as 4 slot time (in practice, in STA2 occurs, STA2 subtracts a random number out of the random-number range 0-10, and [0078] Since waiting slot time is given once to the collision—avoidance period with the lower [0078] Furthermore, in the 4th transmission, when the data packet which should transmit to

priority of a data packet to two alots according to these above operation gostalten. Priority compares with a high data packet. The low data packet of priority Evan if the same random

JP 2001-237839, A [DETAILED DESCRIPTION]

actually digrated becomes long 1.5 times, and the probability to transmit proviously a data [0030] Next, <u>drawing 4</u> explains the 3rd operation gestalt of the wirelass packet priority-control packet with priority high as a result becomes high. number value is given, it sees end the slot time as upper Tow is the same, the time amound

approach by this invention,

number, collision evoidance is carried out and it is transmitted the transmitting probability of a data packet by changing the generating range of a random number, without changing the digestive approach of modification of slot time or a collisionevoldance period like the 1st and 2nd operation gestalt mentioned above, and giving priority to [0081] This operation gestalt is the exprosech of performing weighting to the range of a random

part which the range of each other overlaps from this operation gestalt. classifying the perfect random-number range according to the priority of data, and making the to transmit the low packet of priority from the random-number value lengthered first by not [0082] A short collision—evoidance period may be assigned to the terminal which is aircady going

minimum value in the range of a random number always. henceforth fixed so that it might not become below the value that imposed slet time on the minimum value of a random-number value in the collision-avoidance period of the 2nd evoldance period it considered as the approach of adding the slot time equivalent to the opposed to the terminal which is going to transmit the low data packet of priority a collisionstood by transmission by the conventional approach instead, with this operation gestaft As [0088] As opposed to the collision-evoidence period Tow being shortened only for the part which

can transmit first by this setup becomes high. 0-7. The probability which the terminal which is going to transmit the high data packet of priority going to transmit the high data packet of priority sets up the random-number range given with the range of the random number given when making 3 slot time into fixed time amount, end is example, STA2) which is going to trensmit the low data packet of priority tends to set to 3-10 collision avaidance period Tow setup, the terminal (for example, AP) which the terminal (for [0084] Concretely, as range distribution of this random number is shown in drawing 4 , in a

same as that of thewing I and the swing I which were mentioned above. high data packet of priority exists in AP, and the low data packet of priority exists in STA2 is the [0085] In this <u>drawing 4</u>, the extuation to the condition that STA1 ands transmission of data, the

avoidance period is the same as what is always being fixed. becomes 3 slot time, and substantially, 3 slot time by the side of the head of a collisionsubtracts a random number. By such setup, even if STA2 can give the minimum value, it and subtracts a random number from the inside. Moreover, the random-number range of STA2 which is going to transmit the low data packet of priority considers as the integer to 3–10, and random-number range of AP which is going to transmit the high data packet of priority with 0-7 [0086] The actuation which performs the priority control of this operation gastat sets up the

be taken. In drawing 4, if "4" is given to AP from the random number range and "7" is given to [0087] Thus in the low data packet side of priority, the fixed value of immobilization will surely

a cable network side again, again, a random number is subtracted out of the random-number range 0-7, for example, "8" is given to the collision-avoidance period of eaAP. [0088] And when AP transmits the 1st data and the high data packet of priority reaches AP from

control becomes a part for 1 stot time, and a part for the remaining 3 slot time is carried over as counted as digested slot time. For this reason, the digested number of slots in the last back-off time amount for which it must wait back-off control, since it is the period for which it must wait, a part for 3 slot time is not digests only 4 slot time, and serves as remainder 3 slot time. However, emong this 4 slot time, in [0089] Moreover, in the collision-evoldence period Tow, STA2 postponed in the 1st transmission

at the time of the 1st transmission. Moreover, in AP, a random number is subtracted out of the time by which 3 slot time for which it must wait was added to 3 slot time which was not digasted [0090] In the 2nd transmission, the collision-evoldance period Tow in ++STA2 turns into 6 stat

> the random-number reage 0-7, "T" is given, and the collision-evoidance period Tow of eap. packet of priority reaches AP from a cable notwork again, AP subtracts a random number out of [0091] And the 2nd data packet is transmitted, after progress of DUFS (TD), when the high data evaluance period Tem in STA2, and transmission of AP is performed preferentially. data packet, the collision avoidance period Tow of AP becomes shorter than the collisionrandom-number range 0-7, for example, "3" is given. Thereby, also in the 2nd transmission of a

[0033] Therefore, since the collision-evolutence period Tow of STA2 turns into [ the collisioncontrol, although 3 slot time is directed and 8 slot time turns into residual time, the collision-[0092] Moreover, as for the collision—avoidance period Tow of #+STA2, in the 2nd back-off into said residual time at 3 slot time which surely turns into the latency time. evaidence period Tow of this \*\*STA2 turns into  $\theta$  slot time which edded 3 slot time which turns

data can be transmitted. evoidance period  $\mathsf{Tcw}$  of  $\mathsf{AP}$  ]  $\mathsf{S}$  slot time by  $\mathsf{7}$  slot time, STA2 of time amount is shorter and

transmit the low data packet of the priority of a data packet, as explained above, and adding the [0095] The above explanation described the case where the high data packet of priority was sick time which was not digested by the last time except waiting siot time. head side faced at the collision-avoidance period Tow given to the terminal which is going to gestall preparing beforehand the waiting slot time which surely turns into the latency time in a transmitted praviously become high, by the priority-control approach of this 3rd operation [1094] It is the approach of making it the probability for a data pecket with high priority to be

of the data generated in each STA is carrying out in the procedure shown below, and becomes controllable as a system. the priority of the data from AP to STA it is managasable unitary by AP. A setup of the priority moinly transmitted to STA from AP, with the 1st thru/or 3rd operation gostalt About a setup of

by the priority from AP further. data packet to AP, and need to obtain the authorization to performing data packet transmission and drawing 4, all STAs need to ratify the priority of the data packet, before transmitting a [0098] First, in order to enforce each priority-control approach explained in drawing 1, drawing

to be the need in the data packet transmission. drawing 4 transark to AP by making into a communication packet priority information considered [0097] In advance of data packet transmission, STA1 and STA2 in <u>drawing 1, drawing 3</u>, and

priority level demanded from whole traffic and whole STA, and transmits this as a communication STA1 and STA2 determines the priority permitted to STA1 and STA2 in consideration of the packet by return to each STA [0098] First, AP which received the communication packet including priority information from

operation gasteft which shows the die length of stot time in <u>drawing 3</u> by the priority-control expresch of the 1st operation gestalt shown in drawing 1. destive approach of sict time in denter 4 by the priority-control approach of the 2nd from this AP by the priority-control approach of the 3rd operation gestalt which shows the range of a random number according to the priority information on the communication packet (0099) And STA1 and STA2 perform a priority control by performing weighting in the generating

STA in advance of ectivation of a priority control, system control can be carried out so that each STA may acquire freely high priority and may not perform data transmission. [0100] By performing a setup of the priority by the communication packet between such AP-

becomes high it enables this to perform a priority control, with the features of a contention to become short ] high, and to trensmit previously a data packet with priority high as a result uses that the probability for the higher one to become [ the probability for the die langth of Tow access control not bot [0101] Thus, as for the priority control approach of this invention, the priority of a data packet

packets similarly as a best effort type, but performing priority attachment, as explained in full [Effect of the invention] the priority control by according to this invention, treating not all data "a best effort type" — it comes to be able to perform preferential packet

transmission For this resson, although the domand to QA is not carried out, the wireless packet priority-control approach whose fluxible correspondence to the user who wants to receive preferential treatment of service from a best effort type is attained can be offered.

[Translation done.]

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precisely.

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### TECHNICAL FIELD

(Field of the fiventian) This invention relates to this wheless packet priority control approach which makes possible the priority control which started wireless LAN, especially distinguished the packet in within the limits of a best effort type.

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JP 2001-237839 A [PRIOR ART]

### \* SECTION \*

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### PRIOR ARI

[0003] This convention is described by the detail at "IEEE802.11, Oraft Standard for Wireless wireless LAN eystem specified in IEEE 802 Committee is typical (Osscription of the Prior Ard) Generally, as a wireless access method, the access method in the

using the CSMA/CA (Carrier Sense Multiple Access Collision Avoidance) method which transmits data is used. packet may not arise. DCF (Distributed Coordination Function decentralized control procedure) beso transceiver station (AP) and a subordinate carry out corrier sense so that the collision of a (0005) Hare, about the contention access control, while two or more STAs (radio station) of a [0004] The access method of a MAG layer is described in "XEEE802.11 specification." 1998." Hereafter, this convention is called as "IEEE802.11 specification" and explained LAN Medium AccessControl(MAC) and Physical Layer(PHY) Specification, P802.11D 8.0, 1 May

passage of time, for example, the ectuation after data transmission of STA1 is completed is which carry out wireless packet communication are shown by making an axis of obscisss into the (0006) <u>Drawing 5</u> shows the communication link sctuation to the time amount in DCF which IEEE802.11 specification" is shown in this drawing, two radio stations (STA is called hereafter)

date packet signal relates to this invention. of access. In addition, DIFS used as the cernier sense time amount in the case of transmitting a sense for AP and STA to get to know the condition of a wireless medium, and four kinds such as (ExtendedIFS) are specified in the short order of time amount, i.e., the high order of the priority SIFS (Short IFS), PIFS (PCF(Point Coordination Function) IFS), DIFS (DistributedIFS), and EJFS [0007] Here, in "IEEE80211 specification", IFS (Inter Frame Space) is the time emount of carrier

assumed that AP and STA2 suited the transmitting standby condition. [0008] Hare, deta transmission is performed from STA1 to AP at time of day T, and it is

which enswers reception of that, AP and STA2 stand by until they carry out (TD) progress [0003] First, STA1 transmits data Pt to AP, and after receiving from AP the ACK packet (Pa)

value, and the collision-avoidance period Tow comes. amount (slot time) of a collision-evaidence period is spent on the acquired random-number distributes uniformly in the decision of this collision—avoidance period. And the base unit time all STAs containing AP subtract the random number which the integer of a certain range multiplication of base unit time smount and a random number so that it may mention later. amount is given to each of AP and STA2. This collision-avoidance period is searched for by the [0011] AP and STA which have the data packet which should transmit as the Ruhr in [ whols ] (0010) And the collision-avoidance period (Contention Window:Tow) used as random time

preferential and the collision-avoidence period Tow of given AP transmits data to STA1 from AP explained hemseforth, it is the same. Since it is short compared with STA2, AP becomes evoldance period of 7 come x slot time is given to STA2. Also in the drawing of this invention exemple, the collision-evoidance period of 4 coma x slot time is given to AP, and the collisionprogress. In grewing 8, 1 sleet time (the number of 1 slots) is illustrated with one come, in this [0012] Transmission is started if a wireless medium does not become a busy after this period

efter this collision-avoidance period (4 slot time) progress. Transmission of STA2 et this time is

period progress, since Tow in the back off of STA2 becomes the shortest shortly, STA2 [0013] Furthermore, the ACK (Pa) transmission to AP is ended, and further, after DFS(TD) rettom of a race condition by the above sequences. recomes data ready for sending ability. The collision is ensuring fittle pecket transmission to the

ecquired with the random number, respectively before data transmission, they become possible transmitting to coincidence by carrying out standby of a different collision-avoidence period coincidence probable, and the latency time in this back off hits at a collision-avoidance period preventing the collision of a data packet ] (0015) In order for two or more STAs which have data which should be transmitted to prevent above is actuation for reducing the collision between STAs which are going to transmit to [0014] The RANDEMU back off used as the latency time after the DIFS progress mentioned

(0016) Drawing 6 is drawing for explaining the another conventional approach.

of a packet which should be transmitted subtracts changes that range not according to uniform distribution but according to the priority performed because the random number which STA with the data packet which transmits avoidance period Tox, and the priority control according to the priority of a data packet is technique mentioned above, priority attachment is performed to the dis length of the collision of data and the collision-avoidance period Tow was given at random with the conventional [0017] In this conventional example, although are concerned, there is nothing in the importance

to the priority of the pecket of data which should transmit the integer range over which this present aircumstances, in determining the collision-evoldance period Traw which is a period of the back off, each of STA and AP subtracts a random number, but weighting is made according random number is distributed STA2 pass between DIFS(s) (TD), a procedure moves from them to the back off. Under the packet P2 has priority lower than P1, 5 slot time surely turns into the latency time. \*\*\*\*\*\*\*\*\*\*\*\* ] i.e., the slot time of 5-10 is in a data packet P2. In this casa, since 8 data [0019] After STA1 receives the ACK packet to own data transmission, efter both AP, STA1, and value)+0-5 [ 0-5 are essigned to this data packet P1 for slot time and / slot time / with AP after packet transmitting termination of STA1, and has those Requests to Send 5/fixed un-given to STA2 in the packet data P1 with which priority is given to transmission compared two games sharing the same frequency, and AP has the data packet P2 over which priority is [00.18] This example shows what communicates by AP and the radio station (STA1, STA2) of

0-5 as waiting slot time for transmission of a data packet P1. between transmission of a data packet P1 to 0-5, #+ Value 3" has been obtained from between reason, the weiting slot time in this back off is again set to "6," \*\* "4" has been obtained from this is smaller than "5" of the stot time which must be made into the latency time. For this back off is again set to "6," \*\* Set, tha waiting sbot time in the last back-off control is "3", and slot time which must be made into the latency time. For this reason, the waiting slot time in this \*\* The waiting slot time in the last back-off control is "4", and this is smaller than "5" of the the is given for a date packet P2 from between 5-10 as the packet transmitting latency time. [0020] By \*\*\*, since priority is lower than a data packet P1, specifically, for exempts, "6" slot

may wait  $[\inf/\operatorname{slot} time/5]$  in the minimum /\* back-off control 1 the data packet of AP will surely be transmitted in advance of STA2 that AP may transmit the high packet of priority and 0-5, and STA2 may transmit the packet with 5–10. Thus, in order that STA2 which is going to transmit the low data packet of priority with low priority as for the range of a random number, the range of a random number is set up to the header information in the head of the data which should be transmitted etc. And in order [0021] In the case of  $i_{\overline{m}ming}$  6 [ such ] the priority of transmission is determined with reference

becomes possible by changing the range of a random number according to the priority of a data [0022] As mentioned above, the priority control within a contention access-control DCF period

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## EFFECT OF THE INVENTION

transmission For this reason, although the demand to QA is not carried out, the wireless packet priority confind approach whose Berible correspondence to the user who wants to receive [Effect of the invention] the priority control by according to this invention, treating not all data packets similarly as a best effort type, but performing priority attachment, as explained in full detail above — "a best effort type" — it comes to be able to perform proferential packet preferential treatment of service from a best sifort type is attained can be offered.

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## TECHNICAL PROBLEM

(Problem(s) to be Salved by the Invention) The priority control set as the object of this invention has a typical method using the priority class specified in IEEE 802 Committee. This convention is described by the detail at "IEEE P802.1D Amex H. Design Consideration for Treffic Class Expediting and Dynamic Multicast Filtering, P802.1D, 25 May 1988," Hereafter, this convention is called "IEEE P802.1D specification."

[0024] Although the class which asks for a positive guarantee of qualities of service [ class / in "IEEE P802.1D specification" / priority ] such as a guarantee of the maximum time delay or a guarantee of bandwidth, here, and a guarantee are not needed, they are divided roughly into a preferential BESUTIOETO modd class with priority higher than a best effort type (excellent effort modd). The priority central in this invention is the type of the latter which performs control according to the priority in the inside of a best effort type.

[0025] Here, in DCF in "EEE 802.11 specification", the period "Contention Window" required in order to make a contention access control without a collision possible by applying the integer given to the number of slots which is the fixed length conventional time with the generated random number is set up.

[0028] By the way, in order to perform the priority control according to that priority to a data packet with priority, in the wireless access method which gave sementics, priority attachment is needed but for transmitting specing of data to a satup of Tow, and in the decembralized control DCF based on CSMA/CA, since it sets it as the arain purposes to give "a fair access opportunity", this priority attachment is not performed.

[0027] That is, since the die length of the collision-evoldance period Tow is set up taking solventage of the random nature of a random number which made it generate from the integer which distributes uniformly the slot time which is the conventional time of the back off by considering as fixed time, the way things stand, control to the priority of a packet cannot be performed.

[0028] Moreover, there is a method of changing the integer range over which it is distributed according to the priority of a data packet to the random number subtracted in the case of a collision—avaidance period Tow setup as the priority—control approach based on DCF as which the former which was mentioned shows is proposed.

[0028] However, it must wait for 5 slot time of the collision—avoidence period in the range where the low data packet of priority is prepared for the high data packets of priority after DFS termination even when the high data packet of priority does not exist, for example, <u>drawing 6</u>, by this approach. The unnecessary lateracy time will exist by this and there is a problem of causing decline in frequency use effectiveness.

[0030] Furthermore, in a setup of the non-competing access period by the centralized central of AP, to QA of a priority control and a communication link being attained, by DCF which offers the contention access period by distributed cooperative central, even if it can perform a perfect priority central, carrying out to a guarantee of communication link quality has the trouble that it is difficult and the features of each control approach of PCF and DCF cannot be utilized thoroughly for this reason.

(0031) Then, this invention sims at offering the wireless packet priority-control approach in

which the features of the "fairness of secass" which a contention access control has which solve the trouble that the priority control which followed the priority of data by performing a setup of the collision-evolutance period Tear based on the random random number is not made, and are not in the priority control within the DCF period by which the conventional proposal is made were made to reflect more.

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JP,2001-237839,A [MEANS]

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3. In the drawings, any words are not translated. 2 \*\*\* shows the word which can not be translated

and a data packet with priority high as a result is transmitted previously. evoidance period (Contention Window.Tow), the probability which becomes short becomes high date is higher as short time amount for slot time, as for the die length of a random collisionpacket sets up said slot time short is offered in a setup of the collision-avoidance penod control approach that a data packet with the higher priority information on said memorized deta higher by such wireless pecket priority-control approach by setting the one where the priority of [0033] Even if a large random number is given to the one where the priority of a data packet is (Contention Window) which consists of a multiple of base unit time smount (slot time). before the data transmission by said contention access control The wireless packet prioritytransceiver station and said radio station Memonizo, while acquiring this priority information, and transmitting processing within the contention access-control section is received, said base which shows the height of the priority in the inside of the best effort type which should porform Avoidance) which transmits a wireless packet if a data pecket including the priority information the contention access control based on CSMA/CA (Corner Senso Multiple Access Collision wirebes packet priority-control approach in the wireless packet communication which performs independently at the time of a communication link. The collision of a packet is evoided in the number use a common radio channel, and the propriety of transmission is multually judged pecket communication, and said base transceiver station and the radio station of said large station and a dependency, and consist of two or more radio stations which perform wireless order that this invention may attain the above-meralioned purpose, Are in this base transociver Means for Sciving the Problem] The base transceiver station connected to a cable network in

it judges whether it is the date pocket which asks for QA (step S4), and if it is the date pecket guarantes) (step SS), and will transmit to the wireless terminal STA by centralized control PCF which asks for QA by this decision (Yes), it shall be a QA mold (a band guarantee and time delay data packet is insurted in the queue corresponding to the priority checked here (step S3). Hare, control information which AP reports that this paried and period are. repealed a fixed period, and wireless packet communication is performed by directing by the [0038] First, AP will check the priority of a data packet, if a data packet including the priority end transmitting a wireless packet, and the non-competing access control by AP poling is control based on the OSNA/CA (Carrier Sense Multiple AccessCollision Avoidance) method of cable network, and a radio station (STA) which is in this AP and dependency and carries out nformation on data that it arrived from the cable network side is received (step S1) (step S2). A judging the propriety of transmission autonomously mutually, permitting the collision of a packet, (0035) Under the present circumstances, the period which performs the contention access wireless packet communication, and AP and all STAs are using the common radio channel communication link of this invention consists of a base transceiver station (AP) connected to a concept of the wireless packet priority-control approach by this invention is explained. The datail with reference to a drawing. First, with reference to the flow chart shown in drawing 2, the Embodiment of the Invention] Hareafter, the operation gestalt of this invention is explained to a

[0037] On the other hand, in not being the data packet which asks for OA, it judges whether it is

the packet (excellent effort mold) which should transmit more preferentially than (No) and a best

random collision—avoidance period (Contention Window:Tow) will be given as usual to each of AP and STA2. Let this collision—avoidance period be the collision—avoidance period Tow over the which were lengthened from a certain range. base unit time earount (slot time) in the random-number value and collision-evoldance period best effort type, it will be recognized as what is (No) and a best offort type (step Sil), and a [0038] By this decision, if it is not the packet which should transmit more proferentially than a

(step S9), and if the radio frequency is intect (Yes), as soon as the given collision-avoidance period will become zero (step S10), it transmits (step S11). Moreover, in decision of said step S7, recognizes as (Yes, i.e., an excellent effort mold) (step S12). when it is the packet which should transmit preferentially rather then a best effort type, it (DO39) And it judges whether a radio frequency is intact after progress of a DIFS (TD) period

evoldance time amount to become short may become high by the approach of performing priority attachment by the back-off control period mentioned later (step S13). mold By setting up die langth short, it sets up so that the probability for random collision-[0040] Tew which is explained with the operation gestalt manifoned later in this excellent effort

contention access-control section is received. AP will be memorized while it acquires said priority within the best effort type which should perform transmitting processing within the priority information. period. Here, it a data packet including the priority information which shows the height of the information is received, it will transmit to the purpose terminal in a contention access-control is a non-competing access-control period, and when a data packet including the other priority s data packet with such priority is transmitted to the purpose terminal in the PCF period which information which shows the permission transfer delay time emount and the necessary minimum bandwidth of the date with which AP specifically arrived from the cable network side is received. period will become zero (step S15), it transmits (step S16). If a data packet including the priority (step S14), and if the radio frequency is intect (Yea), as soon as the given collision—avoidance [0041] And it judges whether a radio frequency is littact after progress of a DIFS (TD) period

from the high class of priority is made high in a setup of the collision-evoidence period Toar of contention access control, a random number will be subtracted, and the probability which the standing by only the value. high pecket of priority can transmit to order first by shortening the die length of the slot time [0042] Furthermore, if the wireless circuit is vacant before transmitting the data based on a

number slot other than the assigned slot time. the latency time (waiting slot) of the slot time basis still more nearly excessive N times for every attachment performs carrier sense of the slot time basis in back-off control, originally it inserts primity to a setup of the collaion-aveidance period Tow of DCF control in a collaion-avoidance period Tow setup of a contention access control as the 2nd method of performing priority [0043] Furthermore, in case the terminal which is going to transmit the low data packet of

number is set to 🕶 back-off control. Surely Waiting. When other STAs transmit data during a value which imposed slot time on the minimum valus in the range of the subtracted random of DCF control in the case of a collision-evoldance period setup by the contention excess the terminal which is going to transmit the low data packet of priority The time amount of the control, and the random number assigned from each integer range is determined. which is not concorned with priority but has a fixed value in the subtracted rendom number. And [0046] Furthermore, it considers as a collision—avoidance period by multiplying the alot time an approach of performing priority attachment in a setup of the collision-avoidance period Tox the generating range of the random number which each STA subtracts is left and determined as amount from which the collision-avoidance period Tow of the terminal which is going to transmit [0045] Moreover, the part which the range overlaps mutually by the priority of a data packet in the low data of priority by this serves as zero as a result of [ its ] lateness is made high. [0044] The probability that the high packet of priority can be first transmitted for the time

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of slot time for which it exceeded and waited packet of priority can be transmitted first is made high by reducing only the part of the number the time emount for which it must wait in we back-off control, the probability that the high waits for the collision-svoidance period of a next contention access-control period exceeding collision-avoidance period, the data transmission from the end of a local is interrupted. When it

return [ time amount / the / base unit ]. collision avoidance period permitted to this STA and transmits a connection packet to STA by communication packet determinss the die length of the basic time-basis time amount of the STA to AP, in advance of transmission of a priority data packet, STA transmits the priority of the packet which transmits to AP as a communication packet. And AP which received the [0047] Moreover, when there is a data packet Request to Send of the going-up direction from

eccording to the class of data transmitted. length and the random number of slot time in the collision—avoidance period Tow are distributed is realizable to a "best-effort" data packet by satting up the integer range over which the die turns up the setting information on Tow, and transmits by the communication packet to STA [9049] As mentioned above, the priority control of the data packet of an "excellent effort mold" this STA corresponding to the priority of a packet, or the generating range of a random number, communication packet determines insertion spacing of the waiting slot time in Tew permitted to the packet which transmits to AP as a communication packet. And AP which received this STA to AP, in advance of transmission of a priority data packet, STA transmits the priority of [0048] Moreover, when there is a data packet Request to Send of the going-up direction from

approach by this invention. [0030] <u>Drawing 1</u> explains the 1st operation gestalt of the wireless packet priority control

of a bast effort type taking advantage of the features of fairness serious consideration of a to the priority of data, and is the method which performs the priority control in within the limits the unit time amount of one slot of AP or STA, and setting die length as it beforehand, according the wireless medium between AP and STA, and / back-off control ] It is distinguishing between [0051] This 1st operation gestalt is Tow [ in / it is an access-control method based on DCF in

shortened, and the probability which can be transmitted first is made high collision-avaidance period of the terminal which is going to transmit the high packet of priority is (TBxxx=0-10) of a long period to low packet transmission (for exemple, the STA side), the high packet transmission (for example, the AP side) of priority and priority gives the slot time unit time emount, without changing the range of a random number, and slot time is changed excellent effort mold, priority attachment of Tow is performed. Here, it distinguishs between base (9053) As shown in  $ext{dramine 1}$  , priority is given because give alot time TA of a short period to [0052] In step S7 of the flow chart of <u>drawing 2</u> mentioned above, when recognized as the

performed with a degree of freedom. Therefore, a setup of the priority of a transmitting probability according to priority can be width of face of slot time, the relation of both slot time does not need to be an integral multiple data pecket of priority with the priority of how much to the low data packet of priority, by the [0054] In addition, in order to perform the approach of weighting whether to transmit the high

data packet of the priority of the weiting for transmission existing in STA2 further, being completed, a packet including priority reaching AP from a cable network side, and the low shown on an axis of ordinate, the data packet transmission to AP from STA1 and ACK reception time-sais along an axis of abscissa, actuation of the communication link in each terminal being operation gestalt is explained. <u>Drawing 1</u> is an example about the control at the time of taking a [0055] The example of operation at the time of performing the priority control in the lat

high, and is made law [ priority ] which serves as the description with this operation gestalt is (0056) 1 slot time over the STA2 side by which priority sets to TA 1 slot time over AP made

period DIFS (TD) defined beforehand AP and STA2 with the packet of the waiting for transmission go into the carrier sense of the [0057] First, after STA1 receives the ACK pecket which is the check over transmission to AP,

> in the example in  $ext{streng}(1)$  a random number is subtracted and each slot time is applied to the lengthened random-number value. on this relation, and out of uniform distribution with the equal integer range (referred to as 0-10 differs. In ediction, et the example shown in distring 1, it is 1=1.5, — It is referred to as (2), It is the slot time given to the die largth TA and STA2 of the slot time given to AP is TACTB. — (1) pecket which AP is going to transmit considers as a high thing the relation of de-length TB of transmission, respectively. Under the present circumstances, when the priority of the data (TB=kxTA it it becomes rate) of the priority of the data packet transmission from which priority and STA2 start the back-off control used for the collision evolutance of data pecket (20058) After this DIFS period (TD) checks that a wireless exedium is a no-transmission state, AP

period of AP was 7 stat time and the collision-evoldance pariod of STA2 was 6 stot time, since it ratio of the packet priority of AP and STA2 mentioned above although the collision—avoidance was 1.5 times, is 7xTA(8xTB=6x1.5xTA — (3) However, the relation of Tox of both, who saw from time amount length from (2) types which the [0059] "6" is assigned to "7" and #+STA2 by #+AP in the example shown in degring 1.

sense of a DIFS period (TD) is carried out further. the communication link, efter AP receives ACK (Pa) to own transmission from STA1, carrier It becomes. Thereby, high AP of priority performs data transmission (P1) ahead of STA2. After

be set to TA, and the random number should nearly be subtracted, for example, "4" should be transmission exists again will elent back-off control. At this time, the collision-avoidance period of #NSTA2 turns into 3 slot time which deducted 3 slot time which has passed since 6 slot time. relation of Tow of \*\*AP and \*\*STA2 both is 4xTA(3xTB=3x1,5xTA from (1) and (2) types. — (4) essigned, and the collision-evolutance period should turn into 4 slot time. Consequently, the Moreover, since the priority of the data packet of AP was high the die langth of slot time should [0060] Here, If it is a no-transmission state, AP and STA2 in which the packet of the waiting for

relation of Tow of AP and STA2 is \$xTA>2xTB=2x1.5xTA from (1) and (2) types. — (5) serves as TA if the random number which AP in this back-off control subtracted is "5", the the Request to Send of the high packet of the 3rd priority happens to \*\*AP, and slot time length agein, and AP performs data transmission (P1) previously, it becomes the relation to say, the collision-avoidance period of AP becomes shorter than STA2 [0061] And after carrying out carrier sense of a DIFS paried (TD), in the next back-off control

A next door and the collision evolutines period of STA2 became short, and the transmission of a

data packet P2 of them is attained from AP.

a result. It enables this to perform a priority control, with the fastures of a contention access [ the probability which becomes short ] high, and priority can transmit a high data packet first as data packet is higher, a random cellision-avoidance period (Contention Window Tow) becomes data packet is higher, even if a large random number is given to the one where the priority of a the slot time in a collision—evoluance period is short set up from the one where the priority of a [0062] As mentioned above, since, as for the priority control approach by this operation gestalt,

approach by this invention. [0063] Next, <u>drawing 3</u> explains the 2nd operation gostalt of the wireless packet priority control

was the approach of performing priority attachment to a packet, in this operation greatelt, the range and I slot time of a random number. digestive approach of the given collision-avoidance period Tow is changed, without changing the the range of a random number, the collision-evoldance period Tow is changed, and ethough it [0084] With the 1st operation gestalt mentioned above, 1 slot time is changed without changing

as this result is made high originally essigned. The probability that the high data packet of priority can be first transmitted which stands by in a 1-time excess for every number slot time in addition to the slot time the wireless medium is not used, it is the control approach which inserts the waiting slot time transmit the low data packet of priority in a collabor-avoidance period Tow setup checks that ,0065) In back-off control, in case the terminal with which this operation gostalt is going to

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stat time, and it is the features that the effect can be lessened. time of a high priority packet absence between fixed range, but considering as N time at number indispensable Latency time produced at the time of the low priority packet transmission at the generating range of a random number, Moreover, it is not taking collectively the excessive printity to differ is performed by the approach of digestion of the collision—avoidance period in back-off control, and it can carry out, without changing the width of face of slot time, and the [0067] By this approach, a setup of the priority of the data packet transmitting probability for transmit the high packet of priority as a result can transmit first becomes high priority to transmission decreases, and the probability which the terminal which is going to thing of priority, the latency time of the terminal which is going to transmit the packet with high the directive rate of the collision evolutione period Tow becomes early compared with the low avoidance period Tow is set up at random in the phase which subtracts a random number, since [0056] Therefore, shirtugh it is not concerned with the height of priority but the cellision-

back off control, respectively. operates after progress of DIFS (TD) Eka gimming I mentioned above until AP and STA2 started [0088] First, a series of data transmitting procedures from STA1 to AP are completed, and it should reach AP from a cable network side, and should transmit to STA2 further exists. it is in the condition that the low data packet of the priority which e packet including priority communication link in each terminal is shown on the axis of ordinate. First, a data packet is transmitted to AP from STA1, and reception of ACK (Pa) to the transmission is completed. And [0063]  $\underline{Drawins.3}$  takes a time-exis along an axis of ebscissa, and actuation of the

data of priority, and the low data of priority, one value is given from the random number to [0070] And as for both STAs2 that are going to transmit AP which is going to transmit the high

msy be. Therefore, the collision-evoidance period Tcw turns into 11 slot time and equivalent given to STA2 every 2 slot time, the waiting slot time for 1 time is set as a pan by one so that it number 3" and +4STA2 shall be 7 slot time by random number 7." At this time, in 7 slot time same time amount, and, in the case of the wink 3, 3 slot time according [ \*\*AP] to random— [0071] For exemple, one criterie slot time shall not be based on priority, but shall consist of the

avoidance period Tow early 1.5 times compared with STA2. exists in AP and STA2 both, AP which has the high data packet of priority digests the collisionperiod, since AP and STA2 have set up with 1.5 the ratio of the priority of the data packet which [0072] And although both reduce the collision-evoldance period Tow during the beak-off control

for 5 slot time (in order that three waiting slot time may enter in fact, it is equivalent to 8 slot surroundings and \*\* collision-evoidance period Text becomes next back-off control with a pert transmits data and a part for 3 slot time is digasted is digasted, but, in the remaining parts, up by the rendom numbers in fact since I slot time was added to 2 slot time in STA2 while AP [9018] For this reason, only a part for 2 slot time among the collision—avoidance time amount set

evoidence time emount Tow turns into 6 slot time. Result [ Tow of STA2 by which the 1st transmission was postponed is 5 slot time and it compared 6 slot time of this and AP] (8x slot time / 1.5) ((5x stot time) -- (6) random-number range 0-10 again, and "6" gives — having — se — the following collisionpecket of priority reaches AP from a cable network side, AP lengthous one value out of the [0074] next, AP transmits the 1st data packet, after progress of DUFS (TD), when the high data

of AP becomes short, and it will precede and transmit. Also in a next door and the 2nd back-off control, the direction of the collision-avoidance period

of waiting slot time is contained, it is equivalent to 2 slot time) remains. STA2. 4 slot time is digested and, as for 5 slot time of STA2 \*\*1 slot time (in fact, since 1 time [0075] And when AP transmits the 2nd data packet, since 6 slot time is dignisted by AP, by

random-rumber range 0-10 to it, and obtains random-number value "3" to it. Thereby, Tow of priority reaches AP from a coble network side, AP subtracts a random number out of the [0076] Next, after progress of DIFS (TD), rather than STA, when a data packet with etil higher

HAP serves as 3 slot time.

Tex. (3x slot time / 1.5) > (1x slot time) — (7) time (it is 2 slot time containing one waiting slot time in fact), and they are AP, and STA2 and [0077] By the way, in the 3rd transmission, the value of Tow of low STA2 of priority is 1 slot

this transmission, 2 slot time is digested and the collision avoidance period of AP turns into The data packet of STA2 is transmitted at last by the next door and the 3rd time of these. In

ectually dejected becomes long 1.5 times, and the probability to transmit previously a data number value is given, it sees and the slot time as upper Tow is the same, the time amount compares with a high data packet. The low data packet of priority Even if the same randompriority of a data packet to two slots according to those above operation gastaken, Priority order that two weiting shot time may enter, it is equivalent to 6 slot time). obtains random-number value"4." Thereby, Tow of \*\*STA2 serves as 4 slot time (in practice, in [0079] Since waiting slot time is given ance to the collision—avoidance period with the lower STA2 occurs, STA2 subtracts a random number out of the random-number range 0-10, and [0078] Furthermore, in the 4th transmission, when the data packet which should transmit to

approach by this invention. [0080] Next, <u>the wing 4</u> explains the 3rd operation gestalt of the wireless packet priority-control

packet with priority high as a result becomes high.

number, without changing the digestive approach of modification of slot time or a calision-evoidance period like the fat and 2nd operation gestalt mentioned above, and giving priority to number, collision avoidence is carried out and it is transmitted the transmitting probability of a data packet by changing the generating range of a random [0081] This operation gestalt is the approach of performing weighting to the range of a random

part which the range of each other overlaps from this operation gestall. classifying the perfect random number range according to the priority of data, and making the to transmit the low packet of priority from the random-number value lengthened first by not [0082] A short collision switchnes period may be assigned to the terminal which is already going

evoluence period it considered as the approach of adding the slot time equivalent to the henceforth fixed so that it might not become below the value that imposed slot time on the minimum value of a random number value in the collision evoidance period of the 2nd opposed to the terminal which is going to transmit the low date packet of priority a collisionminimum value in the range of a random number always. atood by transmission by the conventional approach instead with this operation gestaft As [0083] As apposed to the collision-avoidance period Tow being shortened only for the part which

0-7. The probability which the terminal which is going to transmit the high data packet of priority going to transmit the high date packet of priority sets up the random-number range given with can transmit first by this satup becomes high. the range of the random number given when making 3 slot time into fixed time amount, and is example, STA2) which is going to transmit the low data packet of priority tends to set to 3-10 collision-avoidance period Tow setup, the terminal (for example, AP) which the terminal (for [0084] Concretely, as range distribution of this random number is shown in  $\underline{graving}$  4 , in a

same as that of drawing I and drawing 3 which were mentioned above. high data packet of priority exists in AP, and the low data packet of priority exists in STA2 is the [0035] In this  $extit{drewing 4}$  , the ectuation to the condition that STA1 ends transmission of data, the

avoidance period is the some as what is always being fixed becomes 3 stat time, and substantially, 3 stot time by the side of the head of a collision-[0086] The actuation which performs the priority control of this operation gestaft sets up the random-number range of AP which is going to transmit the high data packet of priority with 0-7 subtracts a random number. By such setup, even if STA2 can give the minimum value, it which is going to transmit the low data packet of priority considers as the integer to 3-10, and and subtracts a random number from the inside. Moreover, the random-number range of STA2

be taken. In describe 4, if "4" is given to AP from the random-number range and " $\mathcal T$  is given to [0087] Thus, in the low data pecket side of priority, the fixed value of immobilization will surely

[0088] And when AP transmits the 1st data and the high data packet of priority reaches AP from STA2 from the random-number range, \*\*AP will serve as 4 stot time and \*\*STA2 will serve as 7

time emount for which it must wait control becomes a part for 1 slot time, and a part for the remaining 3 slot time is carried over as counted as digested slot time. For this reason, the digested number of state in the last back-off a cable notwork side again, again, a random number is subtracted out of the random-number range 0-7, for example, "3" is given to the collision-avoidance period of \*\*AP. back-off control, since it is the period for which it must weit, a part for 3 slot time is not agests only 4 slot time, and serves as remainder 3 slot time. However, smong this 4 stot time, in [0083] Moreower, in the collision-evoidance period Tcw, STA2 postponed in the 1st transmission

evoldence period Tow in STA2, and transmission of AP is performed preferentially. data packet, the collision-avoidance period Tow of AP becomes shorter than the collisionrandom-number range 0-7, for example, "3" is given. Thereby, also in the 2nd transmission of a at the time of the 1st transmission. Moreover, in AP, a random number is subtracted out of the lime by vitich 3 slot time for which it must wait was edded to 3 slot time which was not digested [0090] In the 2nd transmission, the collision-avoldance period Tow in \*\*STA2 turns into 6 stat

[0081] And the 2nd data packet is transmitted, after progress of DJFS (TD), when the high date

packet of priority reaches AP from a cable network again, AP subtracts a random number out of turns into 7 slot time. the random-number range 0-7, "7" is given, and the collaion-evoidance period Tow of exAP

evolderace period Taw of AP ceil ceil slot time by T slot time. STA2 of time amount is shorter and evoldance period Tew of this \*4STA2 turns into 6 dat time which added 8 slot time which turns [0093] Therefore, since the collision-evolutance period Tow of STA2 turns into [ the collisioninto said rosidual time at 3 stat time which surely turns into the latency time. control, although 3 stat time is digested and 3 stat time turns into residual time, the callistendata can be transmitted. [0092] Mareover, as for the callsion-svoidance period Tow of s⇒STA2 in the 2nd back-off

slot time which was not digested by the last time except waiting slot time. transmit the few data packet of the priority of a data packet, as explained shove, and adding the head side fixed at the collision-evoldence period Tow given to the terminal which is going to sostalt preparing beforehand the waiting stot time which surely turns into the latency time in a transmitted previously become high, by the priority control approach of this and operation [0034] It is the approach of making it the probability for a data packet with high priority to be

of the data generated in each STA is cerrying out in the procedure shown below, and becomes controllable as a system. the priority of the data from AP to STA it is manageable unitary by AP. A setup of the priority mainly transmitted to STA from AP, with the 1st thru/or 3rd operation gastelt. About a setup of [0095] The above explanation described the case where the high data packet of priority was

by the priority from AP further. data pecket to AP, and need to obtain the authorization to performing data packet transmission 3, and <u>straying 4</u>, all STAs need to notify the priority of the data packet, before transmitting a [0096] First in order to enforce each priority-control approach explained in <u>drawing 1</u> , <u>drawing</u>

to be the need in the data packet transmission. [0097] In advance of data pecket transmission, STA1 and STA2 in drawing 1, drawing 3, and 独的的是 Transmit to AP by making into a communication pecket priority information considered

priority level demanded from whole traffic and whate STA, and transmits this as a communication STA1 and STA2 determines the priority permitted to STA1 and STA2 in consideration of the [0098] First, AP which received the communication packet including priority information from acket by return to each STA.

digestive approach of slot time in <u>drawing 4</u> by the priority-control approach of the 2nd from this AP by the priority-control approach of the 3rd operation gestelt which shows the range of a random number according to the priority information on the communication packet [0098] And STA1 end STA2 perform a priority control by performing weighting in the generating

> opproach of the 1st operation gestaft shown in growing [ operation gestalt which shows the die length of slot time in drawing 3 by the priority-control

to become short] high and to transmit previously a data packet with priority high as a result uses that the probability for the higher one to become [ the probability for the die length of Tow becomes high it enables this to perform a priority control with the features of a contention [0101] Thus, as for the priority-control approach of this invention, the priority of a data packet each STA may acquire freely high priority and may not perform data transmission. STA in advance of activation of a priority control, system control can be carried out so that [0100] By performing a setup of the priority by the communication packet between such AP-

[Translation done.]

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2.4444 shows the word which can not be translated

3.In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

Brief Description of the Drawings]

priority control approach of this invention. Drawing [] It is drawing for explaining the 1st operation gostalt concerning the wireless packet

approach of this invention. <u>Drawing 2)</u> It is a flow chart for explaining the concept of the wireless packet priority-control

priority-control approach of this invention. [Drawing 3] It is drawing for explaining the 2nd operation gostalt concerning the wireless packet

Drawing 5] It is drawing for explaining the conventional contention access—control DOF. priority control approach of this invention. <u>Drawing 4</u>] It is drawing for explaining the 3rd operation gostalt concerning the wireless packet

Drawing 6] It is drawing for explaining the priority control using the DCF control by which the

[Description of Notations] conventional proposal is made.

10 - DFS

Tow — Collision-avoidance period (Contention Window:Tow)

Pt - Priority data packet

P2 — Data packet non-giving priority

AP -- Base station

STA1, STA2 — Wireless terminal

TA -- Slot time (alot time over a priority packet transmit terminal)

TB — Set time (alet time over a non-giving priority packet transmit terminel)

[Translation done.]

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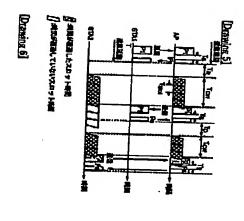
3.In the drawings, any words are not translated. 2.4444 shows the word which can not be translated.

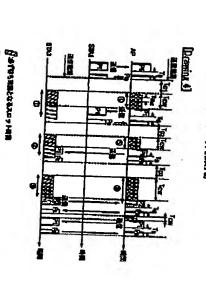
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Drawing 21

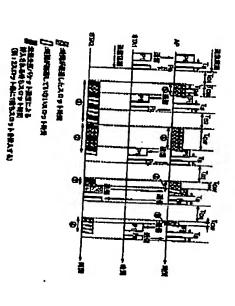
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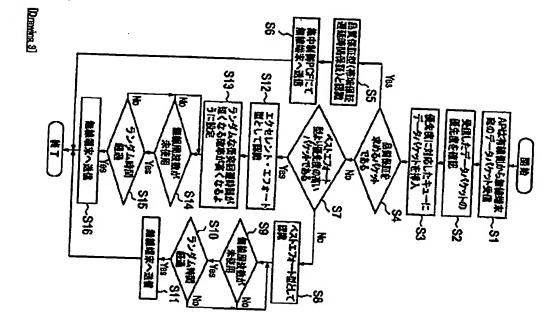




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